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U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1471

CANNING FRUITS AND VEGETABLES AT HOME

THIS bulletin attempts to give in as simple form as possible the application of scientific principles to home canning of fruits and vegetables. Methods of canning are based on knowledge of the causes of food spoilage and ways of preventing it. Scientific research is constantly throwing new light on this subject, and the methods recommended in this bulletin are based on the most reliable information the department has been able to obtain.

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CANNING FRUITS AND VEGETABLES AT HOME

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CANNING is a method of using heat and air-tight containers to preserve food as nearly as possible in the condition in which it would be served when freshly cooked. It is a desirable and economical method of preserving many foods, by means of which their use is distributed over seasons and in places where they are not available fresh. Canned foods thus add variety and make possible a better-balanced diet at all seasons, the value of which to health can not be measured in dollars and cents.

What foods and how much should be canned depend on conditions in each household. Canning should be looked upon not as an end in itself, but as a means of preserving surplus material by the best method for a definite product in order that it may be utilized later to advantage. There is no question that to most people fruits and vegetables are more palatable fresh than canned; therefore it is wise to let the family eat an abundance in season. It is poor economy to cut down on the use of a fresh food in order to have a supply to can, but provision for a surplus for canning should be made wherever practicable by proper forethought in planting. Canning is, under these circumstances, a desirable method of preserving most fruits and many vegetables. Before canning any fruit or vegetable, however, the homemaker should consider whether any other method of

preserving would be better for that particular product. It is usually unnecessary and wasteful of effort to can vegetables that may be stored, such as mature beets, turnips, carrots, sweet potatoes, parsnips, winter squash, and pumpkin, or those that may be successfully dried, like okra and large Lima beans. In some cases it may be desirable to can small quantities of such vegetables for use in the late spring and early summer, when the stored ones have deteriorated and the new crop is not yet available.

If fruits and vegetables have to be purchased for canning, their cost as compared with fresh products out of season or commercially canned goods must be considered. Canning should usually be confined to periods when fruits and vegetables are most abundant, as freshness, quality, and price are then most generally satisfactory. The growth of roadside stands and producer city markets and modern transportation facilities are marked aids in extending the season when fruits and vegetables are obtainable in the fresh state, and in insuring the delivery of these products to the consumer in suitable condition for canning as well as for immediate consumption. Freshness is an essential in products that are to be canned, particularly in vegetables.

CAUSES OF FOOD SPOILAGE

Successful canning is based on an understanding of the two following important causes for the rapid spoilage of fresh foods and on a knowledge of the methods by which this spoilage may be prevented.

First, there are present in all fresh fruits and vegetables substances called "enzymes." These enzymes bring about the normal ripening of fruits and vegetables and, unless checked, the final decay of the product. Since heating is an essential step in canning and these enzymes are easily destroyed by heat, it is only necessary to avoid the changes they may bring about in the food between the time it is gathered and the time it is cooked. This is the reason for the emphasis upon canning fruits and vegetables as soon as possible after they have been gathered.

The second and more important cause of food spoilage is the action of minute plants which are present in the air, soil, water, and, in fact, on everything. There are three groups of these plants—bacteria, yeasts, and molds. Yeasts and molds are easier to kill than bacteria and do not cause so much difficulty in canning. Many forms of bacteria are able when unfavorable conditions arise to go over into a so-called spore, a form in which they are very difficult to kill. For this reason bacteria are the chief factors to be considered in canning. If all bacteria are killed and the product is sealed steaming hot within a sterile air-tight container, the food is said to be sterilized. The application of heat to foods during canning in order to kill bacteria is called processing.

The presence of air has always been associated with food spoilage, owing to the fact that these small plants are present in the air even though they can not be seen with the naked eye. When unheated air comes in contact with food it spoils, not because of the air but because of the bacteria, yeasts, and molds it contains.

TIMES AND TEMPERATURES REQUIRED FOR DESTROYING BACTERIA

In killing bacteria by heat in canning both the degree of temperature and the length of time it is applied must be considered. A very high temperature may produce a sterile product that will keep well, but this may be at too great a sacrifice of flavor and texture. Therefore the temperature applied should ordinarily be the lowest necessary to accomplish the desired result, varying with the kinds of bacteria and with the acidity and other conditions of the juice. No growing or vegetative forms of bacteria will survive for any length of time at the temperature of boiling water (212° F.), but the spore form is killed at boiling temperature only by long-continued heating, especially if the fruit or vegetable being canned has juice that is nearly neutral or only very slightly acid. When the juices are acid, as in fruits and tomatoes, both the vegetative and spore forms of bacteria are killed more quickly at the temperature of boiling water. The bacteria that requires long-continued heating at boiling temperature may be killed more quickly at higher temperatures, such as are obtained in a pressure cooker. The necessary time of heating varies with some organisms from 6 hours at boiling temperature (212° F.) to 30 minutes at 240° F., the temperature obtained by steam under 10 pounds pressure.

The effectiveness of any given method of applying heat to kill bacteria is also influenced by the number present and the time necessary for the heat to reach every portion of the material being canned. This emphasizes the importance of thorough cleansing of the product before starting to can and the use of freshly gathered products free from decay. The distribution of heat throughout every portion of the material being canned depends upon a number of factors and can best be discussed under the detailed directions for different methods of packing and processing.

The types of organisms present vary with different foodstuffs and to a certain extent with geographical distribution. Since some of the most resistant forms of bacteria are present in the soil, any condition of growth that makes products more liable to soil contamination, as in the case of low-growing spinach, or that makes such contamination more difficult to remove, as in the case of the fuzzy string bean, increases the possibility of infection.

Since a number of cases of food poisoning have been directly traceable to botulism, the bacteria causing it have been studied in order to find the temperature and conditions necessary for destroying them. They will not grow in salt solutions where the percentage of salt is higher than 9 per cent. They are destroyed at boiling temperature if the solution is sufficiently acid. With nonacid vegetables and meats there is no assurance that they are killed at the temperature of boiling water unless the material is heated for as long as 6 hours. The heating time may be decreased very much if a higher temperature is used. This is the reason for the recommendation that meats and nonacid vegetables be canned under pressure. Special precaution must be taken in those regions where previous outbreaks of botulism or special difficulties in canning have shown the soil to be heavily contaminated with these or other heat-resisting bacteria.

TYPES OF HOME CANNERS[1]

The most common method of applying heat in home canning is by the use of the water bath. If water is boiled in an open vessel or one on which the top is not clamped down, the temperature reached is never higher than the boiling point of water. All additional heat applied goes to changing the water to steam and the water boils away. The boiling point of water at any place depends upon the atmospheric pressure, which changes with the altitude. At sea level it is 212° F., and it decreases as the altitude increases (Table 1).

TABLE 1.—*Boiling point of water at different altitudes*[1]

Altitude	Temperature of water		Altitude	Temperature of water	
Feet	° *F.*	° *C.*	*Feet*	° *F.*	° *C.*
Sea level	212	100	5,225	202	94
1,025	210	99	6,304	200	93
2,063	208	98	7,381	198	92
3,115	206	97	8,481	196	91
4,169	204	95	9,031	195	90

[1] The directions for processing in boiling water (pp. 15 to 18) are based on the boiling point at altitudes of 1,000 feet or less. For altitudes above 1,000 feet the length of processing should be increased 20 per cent for each additional 1,000 feet.

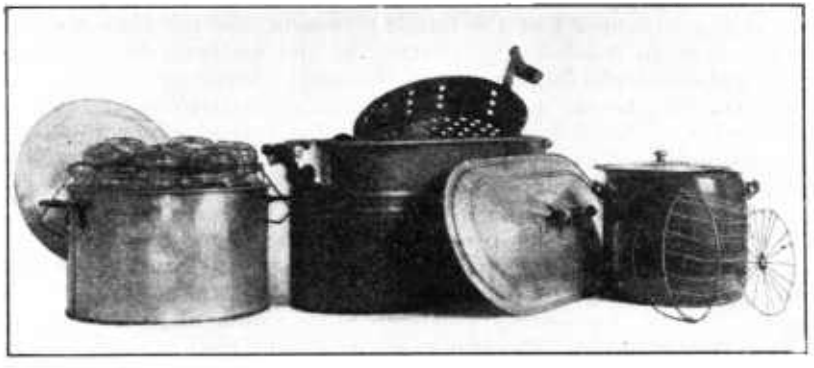

FIG. 1.—Three typical water-bath canners

WATER-BATH CANNERS

A water-bath canner (fig. 1) may be made from a wash boiler, bucket, or any vessel that has a tight cover and is large enough to hold a convenient number of jars. It should be fitted with a rack to hold the jars away from the bottom of the utensil, thus protecting them from bumping or overheating and allowing full circulation of water under them. A wire basket answers this purpose and also makes it possible to lift a large number of jars in and out of the canner at one time. Such a basket can be made by a tinner at small cost or at home from wire-mesh fencing. The water-bath canner can be used successfully for processing fruits, tomatoes, and a few other products (pp. 15 to 18).

[1] The word "canner" is used in this bulletin for the vessel or apparatus in which the cans or jars are processed.

PRESSURE CANNERS

A pressure cooker (fig. 2) is a vessel specially designed for obtaining temperatures higher than can be reached in a water bath. It is impossible to heat water alone to a temperature higher than the boiling point at the particular altitude at which the test is made unless the vessel in which the water is heated is closed and the cover clamped down so that the steam is held in under pressure. Such vessels are known as pressure canners, pressure cookers, and autoclaves.

A pressure canner should be strongly built, and the top should clamp on tightly so that there is no leakage of steam when closed. There must be an air outlet with a pet cock, and the top should also be equipped with a pressure gauge, a thermometer, and a safety valve. Since the temperature is a measure of the pressure, it is

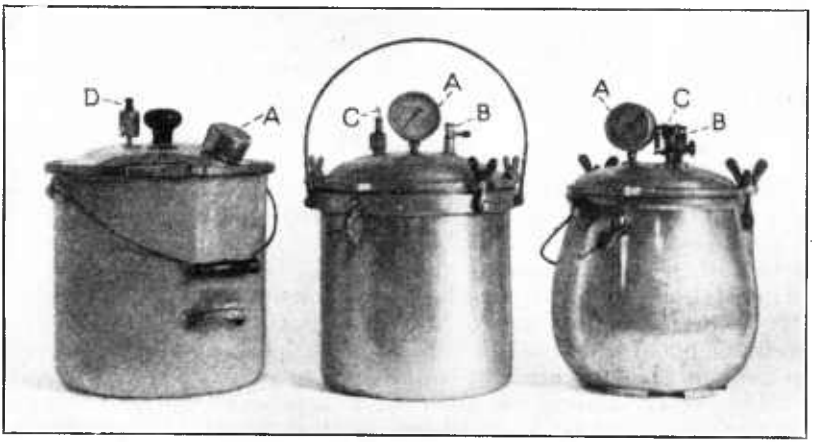

FIG. 2.—Three pressure cookers which may be used for canning small quantities: A, Pressure gauge; B, pet cock; C, safety valve; D, combined pet cock and safety valve. This should not be placed in position until air has been completely removed

ordinarily assumed that one can be interpreted in terms of the other. The pressure gauge, however, does not always indicate the actual temperature within the canner, and it is better to have both a gauge and a thermometer, for one then serves to check the accuracy of the other. The temperature reached in a pressure canner is in direct proportion to the steam pressure and is dependent upon the air having been completely removed. Ordinarily this is accomplished by allowing 3 minutes to elapse after steam issues from the pet cock before it is closed, or it may be assured by never completely closing the pet cock.

In selecting a pressure canner, the above requirements should all be carefully checked. Also in size it should be suited to the kind of containers and the probable number to be handled at one time. In case the canner must be lifted on and off the stove during the canning it is also important that it should not be too heavy. The relationship between steam pressure and temperature is shown in Table 2.

TABLE 2.—*Steam pressure obtained in pressure canners and approximate corresponding degrees of temperature under standard conditions at sea level*[1]

Steam pressure	Temperature	
Pounds	°*F.*	°*C.*
5	228	109
10	240	115
15	250	121
20	259	126
25	267	131

[1] The reading of the pressure gauge is affected by altitude. For this reason it must be increased 1 pound for each 2,000 feet elevation in order to maintain the same relationship between temperature and pressure indicated in the above table. The pressures and times in the table apply from sea level to 2,000 feet. Commencing with 2,000 feet add 1 pound for each 2,000 feet elevation. In case the cooker is equipped with a thermometer the pressure reading may be disregarded and the thermometer used as an indicator of the pressure.

CONTAINERS

Containers for canned products must be so constructed that they can be sealed air-tight to prevent the entrance of air which contains bacteria, yeasts, and molds.

GLASS JARS

The containers most used for home canning are glass jars. By the purchase of new rubbers, and in some cases new tops, they can be used repeatedly. The different types vary in size, shape, and method of sealing, as shown in Figure 3.

The Mason jar has a porcelain-lined metal screw cap. The difficulty experienced by many in cleaning this cap has led to the development of the modified form that has a glass or porcelain top held in place by a metal collar or ring which screws down over it. This collar should be made of a noncorroding metal, because if it corrodes it can be removed only with difficulty and in some cases not at all. As a precaution, when these jars are removed from the canner the metal ring may be taken off and a clean, dry one substituted.

In the wire-clamp glass-top jars the cover is a glass disk which fits down onto the rubber ring and is held in place by a wire clamp. This type of lid is very easily cleaned and sterilized, and if handled with care will last as long as the jar. The jar is easily sealed and can be opened with little difficulty, and only the rubber needs to be renewed each season.

The automatic seal jar has a lacquered metal top. Around the under surface of this is a groove filled with a hard, waxlike compound, which softens when heated and adheres to the glass. During the processing period the top is held in place by a metal spring or clamp which allows the air to escape, but holds the top to the jar, so that when the steam condenses no air is drawn in and a vacuum seal is formed. Also, as the jar cools the special compound hardens, making the seal more complete. A new lid is required each time the jar is used.

Another type of automatically sealed glass jar is being used, especially for products that are to be shipped. It is made of very heavy glass and is somewhat shorter and broader than the usual jar.

The opening has approximately the same diameter as that of the commoner types, and around the top is a heavy projecting rim over which the lid is clamped. The lid consists of a metal disk lacquered underneath, which fits inside of another metal cover. Around the edge of the inner disk is a groove, into which is fitted a gasket of rubber composition. The metal cap that fits over this disk comes down over the glass rim at the edge of the jar, and by means of a special sealing machine it is crimped around the edge and thus held securely in position. This outer metal cap prevents the seal from being broken during transportation. The lids must be renewed each season. This jar is especially adapted to steam-pressure canning, because it does not permit loss of steam or water during processing, as most glass jars do, unless they are very carefully handled.

RUBBER RINGS

An important factor in the successful use of glass jars is the rubber ring. These must be bought new each year and should be of good

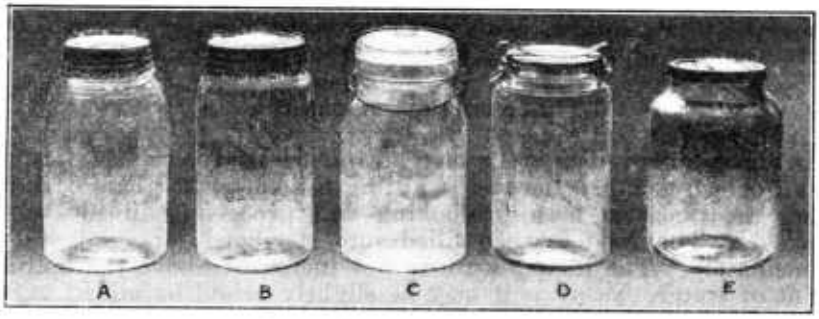

FIG. 3.—Glass jars: A, Mason; B, modified Mason; C, wire-clamp glass-top jar; D, automatic seal; E, jar requiring special sealing device

quality if they are to withstand the temperature of processing. During the war there was much difficulty, owing to the poor quality of rubber used. The rings now available seem on the whole to be of better quality. The simplest test is to double the rings together and press the fold with the finger. The rubber should not crack under this treatment. They should also stretch to twice their length and return without change of shape.

TIN CANS

For commercial and to some extent for home canning tin containers are used. They have certain advantages over glass. There is no danger of breakage, either during canning or afterwards during storage and transportation, and they are easier to handle than glass when processing under pressure. Tin cans also heat through more quickly and may be plunged into cold water immediately after processing, which, of course, is impossible with glass jars. This rapid cooling checks the cooking and produces a more desirable product. The larger opening in the newer type of can makes it

easier to pack some products in cans than in jars. At least two types of tin cans are in use at present.

The first type, the cap-and-hole can, is much like the old-fashioned wax-sealed kind, except that it is sealed with solder instead of with wax. The top is provided with a circular opening which is closed by soldering a tin disk over it with a capping steel. A small hole in the center of the disk allows the air and steam to escape during the exhaust. This hole must be closed by solder before the processing period begins.

The second type of tin can in general use, the sanitary or rim seal, is rapidly replacing all others. The top is entirely open and is sealed by a double seaming of the cover onto its edge. The part of the cover which comes in contact with the upper edge of the can is coated with a compound or fitted with a rubber composition film that makes a seal when the cover is crimped on. The can is sealed with a machine, several types of which are on the market. One of the simpler machines may be adjusted to handle both No. 2 and No. 3 cans and, if desired, can be obtained to fit other sizes (fig. 14).

For use with pumpkin, squash, and beets the cans should be lacquered or enameled. This inside coating, in case it covers the metal completely, retards the action of the vegetables on the tin.

METHODS OF CANNING

In the so-called open-kettle method the material is cooked directly in an open vessel as a means of killing the bacteria. This cooking takes the place of both precooking and processing in the other methods. The food is then filled into sterilized jars and sealed immediately. The temperature is not increased above the boiling point of water, except as it may be slightly raised by added sugar or soluble materials in the juices; therefore this method is suitable only for fruits and tomatoes. The food is heated through more evenly and quickly than when it is heated after packing in jars. The disadvantages of this method lie in the necessity for the sterilization of the jars before they are filled and in the danger of contamination during filling. Furthermore, there is always danger that air containing microorganisms will be incorporated when the jars are filled in this way. If they are sealed and inverted while boiling hot, however, this danger is in part avoided.

The term "cold pack" has been applied to the method in which material was packed cold into the container and then processed either in a water bath or a pressure canner. Fruits and vegetables needing to be peeled or softened in order to be packed to advantage were "blanched" in hot water or steam and then dipped into cold water. Sirup or brine was added, usually boiling hot, but even then the temperature of the food was considerably lower than boiling, when it was placed in the canner for processing. The chief disadvantage of this method is that when the material is packed cold a longer time is required for that at the center of the can to reach the temperature of the canner. This is especially true in the case of such vegetables as corn, that are thick and pasty, or those with mucilaginous juices, for these heat through very slowly. Some fruits, however, with a large proportion of added liquid may heat

through quickly and be successfully packed by this method, but the shrinkage is sometimes greater than with other methods.

HOT-PACK METHOD

The advantages of the open-kettle method and any possible advantages of the cold-pack method of canning are combined in the hot pack. In this a short precooking of the material is substituted for the usually recommended blanching, and the cold dip is omitted. The theory that bacteria are killed by the shock of cold dipping has been proved to have no scientific basis. Precooking in this sense means heating the material in a minimum quantity of liquid until it boils, the material is thoroughly wilted and shrunken so as to facilitate packing, and any inclosed air is driven out. The material is then filled into the container boiling hot and processed immediately. Containers so packed may be sealed without the usual exhaust, and the time required for the material to reach the temperature of the canner is decreased in containers of all sizes.

STEPS IN CANNING

Safe canning requires careful attention to every step in the process.

SELECTING AND PREPARING THE MATERIAL

Use only clean, fresh, sound fruits and vegetables in prime condition. "Two hours from garden to can" is a good rule. In any case for the best results material should be canned the same day it is gathered. If it must be held, discard at once any showing bruises, decay, or other imperfections, and keep the remainder in a cool place in small lots adequately ventilated.

Be sure that the containers in which fruits and vegetables for canning are gathered and handled are clean. Any unnecessary infection at this stage increases the difficulty of processing and the chances of spoilage in the finished products.

Grade for size and same degree of ripeness if a uniform product is desired.

Wash the material thoroughly until every trace of soil is gone. The most dangerous bacteria and those most difficult to kill are in the soil. A wire basket is a help in washing, but should not be loaded too heavily. Always lift the material out of water rather than pour water off.

In case a bushel or more of peaches or apricots is to be canned at one time they may be peeled with the use of lye, but this method is not justified with a smaller quantity. Be careful in using lye, especially if children are around, for it is a powerful caustic and serious accidents have happened.

To peel peaches or apricots with lye, prepare in an agateware or iron kettle, never aluminum, a solution of one-fourth pound (4 ounces or about 4 level tablespoons) of granulated lye of a standard brand in 2 gallons of water. Heat to boiling, and while actively boiling immerse the peaches or apricots in a wire basket until the skin is loosened and partially dissolved. This will usually require 30 to 60 seconds. Remove the fruit, wash it at once in running water, if possible, until skin and lye are removed, and thoroughly rinse the

fruit. If still water is used, rinse the fruit in a fresh supply after washing off skin and lye.

Fruits and tomatoes may be precooked or not as desired (figs. 5 and 6). Nonacid vegetables should always be precooked to remove air, to shrink them, to facilitate packing, and to make possible packing in the container at boiling temperature (figs. 11 and 13).

While the material is being prepared the jars may be put in a water bath to boil. This serves the double purpose of cleansing the jars and of heating them, so that they may be filled with the hot material without any danger of breaking.

PACKING THE MATERIAL IN THE CONTAINERS

Pack the material in the jars or cans. If it has been precooked, work quickly so that it does not cool. Be sure that the containers are completely full, with a sufficient proportion of liquid to solids to prevent too dense a pack, and that there are no air bubbles. In case there is not enough liquor in the precooked vegetable, add boiling water, and to all vegetables add the required quantity of salt. To fruits packed cold, add boiling sirup.

SIRUPS USED IN CANNING

In canning fruits it is advisable to prepare in advance the sirup which will be needed. The degree of concentration of the sirup recommended for different fruits varies and is designated as thin, medium, and thick.

For thin sirup use 1 cup of sugar and 3 cups of water.

For medium sirup use 1 cup of sugar and 2 cups of water.

For thick sirup use 1 cup of sugar and 1 cup of water.

In each case the sugar and water are heated together and stirred carefully until the sugar is dissolved and the sirup brought to a boil. Fruit juice may be substituted for the water in the sirup with marked improvement in flavor.

ADJUSTING COVERS

Place rubbers in position on jars and adjust caps. If the jars are filled with boiling hot material they may be sealed completely before they are put into the water-bath canner, and they should always be so sealed when the pressure canner is used (fig. 12). If the material is not boiling hot when packed, the jars should be only partially sealed when put into the water bath for processing (fig. 7), according to the following directions for the various types. On the screw-top jar, screw the cap evenly about half-way down. With the wire-clamp glass-top jar, screw the cap on evenly and raise the upper clamp in position to hold the lid in place, leaving the lower clamp loose until after processing. On the automatic-seal jar, fasten the cap with the metal spring or clamp.

Seal tin cans which have been packed hot before placing them in the canner (fig. 14). When not packed boiling hot, tin cans should be exhausted before sealing, to remove the air. If cap-and-hole cans are used, adjust and seal the caps, but do not seal the holes until after exhausting. Lids should not be adjusted on sanitary cans until after exhausting.

FIG. 4.—Make the sirup and put the jars on to sterilize while the fruit is being prepared

FIG. 5.—Pack the fruit in the jars and cover with boiling sirup

FIG. 6.—Or precook the fruit and fill it into the jars boiling hot

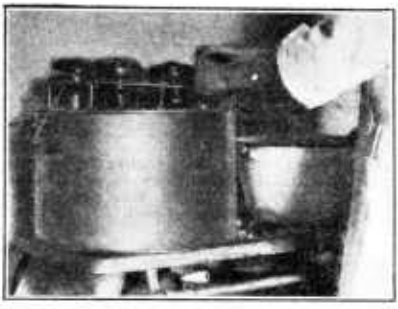

FIG. 7.—Place the rubbers in position and adjust caps (p. 10)

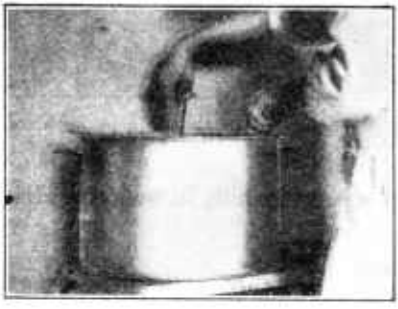

FIG. 8.—Process for the time indicated in the table (p. 18). If not sealed before processing, seal spring caps before removal from the water bath by pushing down the lower wire as illustrated, and tighten screw-cap jars immediately on removal from the water bath

FIG. 9.—Invert the jars while cooling so as to test for leaks. Allow them to cool quickly to room temperature in a place protected from drafts, and keep them under observation for at least a week

EXHAUSTING

The air should be removed as completely as possible from the material being canned before it is sealed in the container. This step is called "exhausting." In the case of glass jars packed with food below boiling temperature, exhausting is done during processing, since they are not sealed air-tight when placed in the canner. There are special devices on the market to exhaust glass jars before sealing. However, since they are normally exhausted as a part of the heating process, it seems questionable whether the extra effort is justified. In tin cans and glass jars packed boiling hot the head space is filled with steam and further exhaust is unnecessary. Heat all other

FIG. 10.—Prepare the vegetable as for cooking and precook as directed (pp. 19 to 20). If glass jars are to be used, put them on to boil

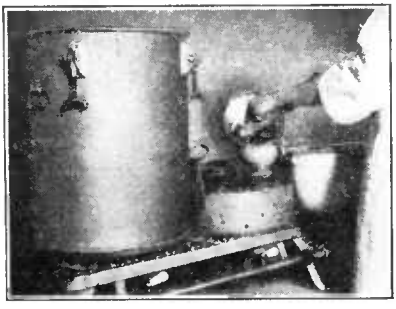

FIG. 11.—Fill the jars with the vegetable boiling hot

FIG. 12.—Place rubbers in position, adjust caps, and seal completely while boiling hot

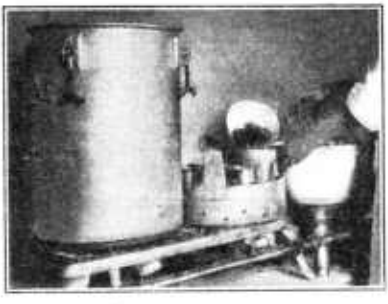

FIG. 13.—Or fill the tin cans with the boiling hot vegetable

tin cans in water or steam bath until steaming hot, in order to drive out air; then seal immediately.

PROCESSING

Heating material to kill the bacteria is called "processing." Process at the temperature and for the time indicated in tables on pages 18–21. Observe the following precautions in using glass jars and tin cans in water-bath and pressure canners.

With the water-bath canner.—Be sure that the jars or cans are far enough apart and that the rack on which they are supported is so arranged that the water can circulate freely under and around them.

Have the water in the canner boiling before putting in any jars or cans. The glass jars must be hot either from preheating in water or from filling with hot material in order to prevent breakage.

When all the containers are in the canner, see that the level of the water comes over the tops.

Count time as soon as the water begins to boil vigorously.

As soon as the processing time is up remove the jars or cans from the water. If the jars were not sealed completely before processing, seal wire-clamp jars before removal from the canner (fig. 8), and

FIG. 14.—Seal the cans immediately while the head space is filled with steam

FIG. 15.—Place the filled containers in the pressure canner. Adjust the cover, but do not close the petcock until steam has escaped for at least 3 minutes. Bring the pressure quickly to the desired point and hold it there for the time indicated in the table (p. 21). Watch carefully and adjust the heat so that the pressure will be kept at the desired point

FIG. 16.—If glass jars are used, open the canner cautiously (p. 14). Invert the jars immediately upon removal. Allow them to cool to room temperature and keep them under observation for at least a week

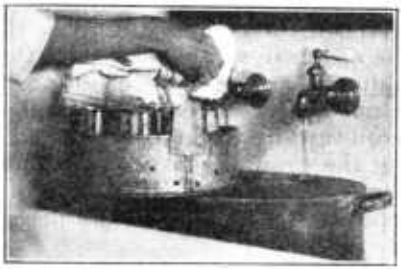

FIG. 17.—If tin cans are used, the canner may be opened more quickly. Plunge the cans into cold water immediately upon removal from the canner

all other jars immediately afterward. Invert all glass jars (fig. 9) and place them so that they will cool quickly to room temperature. Plunge tin cans at once in cold water (fig. 17).

With the steam-pressure canner.—Pour boiling water into the canner until the level is just below the rack that holds the jars. Be sure that there is enough to prevent boiling dry during processing.

When the canner has been filled, adjust the cover and fasten securely. In case the cover is fastened by several clamps fasten moderately tight those opposite each other, one pair at a time; then go back over the whole set and tighten each pair (fig. 15).

See that no steam escapes anywhere except at the pet cock.

Allow the pet cock to remain open until steam escapes from it in a steady stream for at least 3 minutes, indicating that no air remains inside.

Then close the pet cock so that only a trace of steam can escape. Some persons prefer to close the pet cock entirely, particularly with small canners in which a great loss of steam is to be avoided because of the danger of boiling dry.

Allow the pressure to rise until the gauge registers the pressure that indicates the desired temperature.

Count time from the moment the desired temperature and pressure are reached.

Maintain a uniform pressure during the processing period by regulating carefully the source of heat. Fluctuations in pressure, as from 10 pounds to 15 pounds and down again, are to be avoided in any case, and when canning in glass may result in loss of liquid. A sudden drop in pressure through cooling or release of steam may also cause this. It is especially important to avoid having the pressure go so high that the safety valve releases the steam suddenly, nor should the steam be allowed to escape suddenly by opening the pet cock.

At the end of the processing period remove the canner from the fire and proceed according to the following directions adapted to jars or cans:

When canning in glass jars, allow the canner to cool until the steam gauge registers zero before opening the pet cock, and even then open cautiously. This is to prevent too sudden a drop in pressure, which would cause the liquid to blow out of the jars, even though already sealed. Invert the jars (fig. 16), allow them to cool as quickly as possible to room temperature, and do not stack them while they are still hot.

When canning in tin, open the pet cock wide at once and allow the steam to escape rapidly. Remove the cans from the canner and plunge them into cold running water if possible (fig. 17), or if this is not available change the water as soon as it becomes warm. The more rapidly the cans are cooled the less danger there is of overcooking the product. Watch carefully for air bubbles that indicate imperfect sealing. Leakers should be opened, the contents heated and repacked in other cans, and processed again as at first.

CHECKING UP RESULTS

Mark all canned products so that those in each batch can be distinguished. Examine the inverted glass jars for signs of leakage. Hold canned products at room temperature for a week or 10 days, where they can be examined at least once a day to be sure that they are keeping. If the contents of any jars or cans show signs of spoilage, examine all of that lot carefully. After this observation period, store the canned goods in a cool place. A short storage at rather high temperature serves to bring out quickly defects that might not be noticed if the products were stored at a lower temperature. Results can thus be checked up and methods improved.

Destroy all foods showing any sign of spoilage, taking the precautions indicated on page 22. Do not taste food to determine whether or not it is spoiled. All canned vegetables except tomatoes should be boiled before tasting.

DIRECTIONS FOR PREPARING AND PROCESSING FRUITS, TOMATOES, PICKLED BEETS, AND PIMIENTOS

The times given for processing in boiling water apply only to places with altitudes of 1,000 feet or less. For all altitudes above 1,000 feet the time should be increased 20 per cent for each additional 1,000 feet.

When half-gallon glass jars are used, 5 minutes should be added to times given for pint and quart glass jars.

Apples.—Apples should be pared and cut into the sizes desired. If the pieces must stand, place them in a mild salt solution (one-fourth cup salt to 1 gallon water) to prevent them from turning dark. They may be packed directly into jars and covered with boiling-hot thin sirup. Process quart and pint glass jars for 15 minutes in boiling water and No. 2 and No. 3 tin cans for 10 minutes.

Apples packed raw shrink in canning so that the containers are not full. This can be prevented if they are boiled for 5 minutes in the sirup before packing. In this case fill into the cans hot, cover with sirup boiling hot, and process containers of all sizes for 5 minutes in boiling water.

Apples may also be baked as for serving, adding sugar to taste and water if necessary. Pack hot in the containers, cover with hot sirup, and process containers of all sizes for 5 minutes in boiling water.

Windfall or green apples may be made into sauce. Pack boiling hot and process immediately containers of all sizes for 5 minutes in boiling water.

Apricots.—Same as peaches.

Berries.—Gather the berries in shallow vessels so as to prevent crushing, and can them as soon as possible after gathering. Sort the fruit and use the smaller and any imperfect berries for the preparation of juice to use in making a sirup of medium sweetness. Wash carefully and remove caps and stems. Pack the fruit in containers, pressing it gently into place; cover with the prepared medium sirup boiling hot. Process quart and pint glass jars for 20 minutes in boiling water, and No. 2 and No. 3 tin cans for 15 minutes.

Some berries shrink so much during processing that the containers are not well filled and the berries tend to float. This can be prevented by precooking the berries before filling the containers. To each pound of berries add one-fourth to one-half pound of sugar, according to the sweetness of the fruit. Place in a kettle and heat to boiling, stirring gently, and boil for 5 minutes. Pack boiling hot and process immediately containers of all sizes for 5 minutes in boiling water.

Cherries.—Cherries may be canned pitted or unpitted, depending upon personal taste and the way in which they are to be served. If used unpitted they should be pricked to prevent shrinkage. They may be packed in hot containers and covered with boiling sirup, using thick sirup for sour cherries and medium for sweet. A better flavor will be obtained if the sirup is made from the juice which collects on pitting the cherries. Process quart and pint glass jars for 25 minutes in boiling water, and No. 2 and No. 3 tin cans for 20 minutes.

When pitted cherries are used, they may be precooked by boiling for 5 minutes with sugar to taste. In this case fill into the containers boiling hot and process immediately containers of all sizes for 5 minutes in boiling water.

Currants.—Same as berries.

Figs.—Figs are ordinarily preferred in a richer sirup than is usual for canning. For this reason they are more nearly a preserved than a canned product. Sprinkle 1 cup of soda over 6 quarts of sound, firm figs, and add 1 gallon of boiling water. Allow the figs to stand in this soda bath for 5 minutes.

Drain and rinse thoroughly. Bring 2 quarts of medium sirup to the boiling point, and add the well-drained figs. Allow the fruit to boil in this sirup for one hour. Remove the fruit carefully, pack in hot containers, fill with boiling hot sirup, and process immediately containers of all sizes for 5 minutes in boiling water.

Gooseberries.—Use the method suggested for berries packed raw, substituting a thick for a medium sirup. Process quart and pint glass jars for 20 minutes in boiling water and No. 2 and No. 3 tin cans for 15 minutes.

Or, if desired, prepare a sauce by adding a small quantity of water to the berries after they have been sorted and washed, and boiling until the fruit is cooked to a pulp. To each quart of this pulp add one-half cup of sugar or more if preferred. Heat until the sugar is dissolved, and while boiling hot pack in jars. Process containers of all sizes for 5 minutes in boiling water.

Peaches.—Before preparing fruit make thin sirup, or richer if desired. Put in one cracked peach pit for every quart of sirup. Boil for 5 minutes and strain.

Immerse the peaches in boiling water for about one minute or until the skins will slip easily, plunge at once into cold water for a few seconds; remove the skins, cut the peaches into halves, and discard the pits. Or use the lye solution method of peeling (p. 9). Pack at once, placing the halves in overlapping layers, the concave surface of each half being downward. Fill up the containers with boiling sirup. Process quart and pint glass jars for 25 minutes in boiling water if the fruit is fairly firm and hard, or for 20 minutes if it is ripe and tender. Process No. 2 and No. 3 tin cans for 15 minutes.

Pears.—Peel, cut in halves, core, and cook in boiling medium sirup for 4 to 8 minutes, according to the size of the fruit. This precooking makes hard varieties of pears pack better. Pack the pears hot into containers and fill them up with boiling sirup. Process containers of all sizes for 20 minutes in boiling water.

Pineapples.—Peel and core, remove all eyes carefully. Cut into convenient cross sections, pack into the containers, and fill up with thin boiling sirup. Process quart and pint glass jars for 30 minutes in boiling water and No. 2 and No. 3 tin cans for 25 minutes.

Plums.—Plums are ordinarily canned whole, and they should be gathered just as they are commencing to ripen. After they are washed prick each plum to prevent the skin from bursting. Fill into jars and cover with boiling medium sirup. Process quart and pint glass jars for 20 minutes in boiling water and No. 2 and No. 3 tin cans for 15 minutes.

Or, if preferred, prepare sauce by cooking the plums with sugar to taste until the sugar has dissolved. The pits and skins may be strained out or not as desired. Fill the containers boiling hot, and process all sizes for 5 minutes in boiling water.

Rhubarb.—Select young, tender stalks. Trim and wash carefully, cut into one-half inch lengths, pack into the containers, and cover with boiling hot thick sirup. Process quart and pint glass jars for 20 minutes in boiling water and No. 2 and No. 3 tin cans for 15 minutes.

Another method is to cut the rhubarb in half-inch lengths, add one-fourth as much sugar as rhubarb by measure, and bake until tender in a covered dish. Pack this sauce boiling hot, and process immediately containers of all sizes for 5 minutes in boiling water.

Strawberries.—Strawberries contain so much water that the canned product is not very attractive. They are ordinarily more palatable if preserved. The following method is recommended in case they are to be canned: To each quart of berries add 1 cup of sugar and 2 tablespoons of water. Boil slowly for 15 minutes and let stand overnight in the kettle. In the morning reheat the mixture to boiling, fill into the containers hot, and process all sizes for 5 minutes in boiling water.

Tomatoes.—Select firm, ripe tomatoes of medium size and uniform shape. Do not use tomatoes which are overripe or parts of which are spotted or decayed. Put into trays or shallow layers in wire baskets and dip in boiling water for about a minute, according to ripeness. Remove and plunge quickly into cold water for an instant. Drain at once, and core and peel promptly. Pack into jars or cans as closely as possible. For home use, fill with a thick tomato sauce or with the juice of other tomatoes; but if the tomatoes are to

be sold under Federal regulations add only the juice which drains from them during peeling and trimming. Season with 1 teaspoon of salt per quart. Process quart and pint glass jars for 45 minutes in boiling water and No. 2 and No. 3 tin cans for 35 minutes.

Pickled beets.—Select beets of uniform size, cut off the stems, allowing at least 1 inch to remain on the beets so that they will not bleed and lose color and sweetness. Wash them well and cook in a covered pan until tender, in enough water to cover. For young beets this will require about one-half hour. When tender plunge into cold water, remove the skins, and when cool cut in dice or thin slices. Fill the beets into jars and to each pint add one-half teaspoon of salt. Fill up the jars with a mixture of vinegar and brown sugar in equal proportions by measure, heated to boiling, so that the sugar is thoroughly dissolved. If this is too acid, the vinegar may be diluted one-fourth with water. Process immediately containers of all sizes for 30 minutes in boiling water. Pickled beets may be processed in the water bath because of the high percentage of acid.

Pimientos.—The fruit of these peppers has very thick flesh, tough skin, and is comparatively smooth and free from ridges. They should be ripe, sound, and free from bruises. Use only whole peppers. The skin separates if they are exposed to dry heat, as in roasting, or if immersed in hot cooking oil. To accomplish this, they may be dipped in hot cooking oil (290° F.) for 2 or 3 minutes, or placed in a hot oven (450° F.) for 6 or 8 minutes. Cool quickly by dipping in cold water. The skins should then come off readily. The peppers so obtained are soft and pliable and can be folded into the cans after removing stems and seed cores. No liquid is added, since the processing brings out a thick liquor which almost covers them in the can. Add one-half teaspoon of salt to each pint. Process pint glass jars for 40 minutes in boiling water and No. 1 or No. 0 tin cans for 30 minutes.

TIME-TABLE FOR CANNING FRUITS, TOMATOES, PICKLED BEETS, AND PIMIENTOS

The times given for processing in boiling water apply only to places with altitudes of 1,000 feet or less. For all altitudes above 1,000 feet the time should be increased 20 per cent for each additional 1,000 feet.

When half-gallon glass jars are used, add 5 minutes to times given for pint and quart glass jars.

Product	Method of treatment before processing	Processing period in boiling water	
		Pint and quart glass jars	No. 2 and No. 3 tin cans
Apples	Slice, quarter, or halve, then pack in containers and cover with boiling syrup.	15 minutes	10 minutes.
	Or boil whole in sirup, or bake as for serving, and cover with sirup, and pack hot.	5 minutes	5 minutes.
	Or pack hot in form of apple sauce	5 minutes	5 minutes
Apricots	Same as peaches.		
Blackberries, Blueberries, Dewberries, Huckleberries, Logan blackberries, Raspberries	Pack in containers. Fill with boiling hot, medium sirup.	20 minutes	15 minutes.
	Or precook and pack hot	5 minutes	5 minutes.
Cherries	Pack in containers, cover with boiling sirup, using thick sirup for sour cherries, and medium for sweet.	25 minutes	20 minutes.
	Or remove pits, add sugar as desired, bring to boil, and pack.	5 minutes	5 minutes.
Currants	Same as berries.		
Figs	Sprinkle 1 cup of soda over 6 quarts of figs. Add 1 gallon of boiling water. Allow figs to stand in this 5 minutes. Drain and rinse well. Add 2 quarts boiling medium sirup. Boil for 1 hour. Fill in containers. Cover with hot sirup.	5 minutes	5 minutes
Gooseberries	Pack in containers. Fill with boiling hot, thick sirup.	20 minutes	15 minutes.
	Or prepare sauce, using sugar as desired. Fill hot.	5 minutes	5 minutes.
Peaches	Scald, dip into cold water, and peel. Cut into size desired, removing pits. Fill containers, then add sirup of desired consistency, in which one cracked peach pit for every quart of sirup has been boiled.	20 minutes for ripe fruit, 25 minutes for firm fruit.	15 minutes.
Pears	Pare and cook for 4 to 8 minutes in boiling medium sirup. Pack hot in containers and fill with the boiling sirup.	20 minutes	20 minutes.
Pineapples	Peel, core, remove eyes. Cut into convenient cross sections. Pack in containers. Fill with boiling thin sirup.	30 minutes	25 minutes.
Plums	Prick. Fill in containers. Cover with boiling medium sirup.	20 minutes	15 minutes.
	Or bring to boil, using sugar as desired. Fill hot into containers.	5 minutes	5 minutes.
Rhubarb	Cut in half-inch lengths. Add one-fourth as much sugar as rhubarb by measure. Bake until tender in covered baking dish. Pack in hot containers.	5 minutes	5 minutes
	Or pack uncooked with boiling sirup	20 minutes	15 minutes.
Strawberries	To each quart add 1 cup of sugar and 2 tablespoons of water. Boil slowly for 15 minutes. Let stand overnight in the kettle. Reheat to boiling. Fill containers hot.	5 minutes	5 minutes.
Tomatoes	Scald and peel. Pack whole or cut in pieces. Cover with hot tomato juice. Add 1 teaspoon salt to each quart.	45 minutes	35 minutes.
Pickled beets	Precook, peel, and slice in containers. Cover with mixture of vinegar and sugar, boiling hot.	30 minutes	30 minutes.
Pimientos	Heat in hot fat or oven to loosen peel. Peel and pack in small containers. Add one-half teaspoon salt to each pint.	40 minutes pint glass jars.	30 minutes No. 1 or No. 0 tins.

DIRECTIONS FOR PREPARING AND PROCESSING NONACID VEGETABLES

The water-bath canning method has been widely used in the canning of nonacid vegetables as well as fruits and tomatoes. Apparently there is considerable variation in the time required for processing under different conditions of latitude, altitude, and climate, and for that reason the United States Department of Agriculture does not present directions or a general time-table for canning nonacid vegetables by the water-bath method. Because of spoilage difficulties and the risk of poisoning from occasional contamination with botulinus bacteria when nonacid vegetables are canned by the water-bath method, the department recommends the canning of such vegetables with the steam-pressure canner. Where it is not practicable to use the steam-pressure canner, times and methods to be used should be obtained from the specialist at the State college of agriculture.

Asparagus.—Asparagus for canning must be fresh and tender. Pick over carefully, discard any imperfect pieces, sort according to size, and wash thoroughly. Tie in uniform bundles, place in a saucepan, with boiling water over the tough lower portion only, cover tightly, and boil for 4 to 5 minutes; or cut in half-inch lengths, add enough water to cover, and boil for 2 minutes in an uncovered vessel. Pack boiling hot into containers, cover with the water in which boiled, and add 1 teaspoon of salt to each quart. Process immediately at 10 pounds pressure, or 240° F., quart glass jars for 40 minutes, pint glass jars for 35 minutes, and No. 2 and No. 3 tin cans for 30 minutes.

String beans.—Pick over carefully, string, wash thoroughly, and cut into pieces of desired size. Add enough boiling water to cover and boil for 5 minutes in an uncovered vessel. Pack in containers boiling hot, cover with the water in which boiled, and add 1 teaspoon of salt to each quart. Process immediately at 10 pounds pressure, or 240° F., quart glass jars for 40 minutes, pint glass jars for 35 minutes, and No. 2 and No. 3 tin cans for 30 minutes.

Lima beans.—Only young and tender Lima beans should be canned. The older ones may be dried successfully. For the young, tender ones use the method suggested for peas. Process the hot-packed beans immediately at 10 pounds pressure, or 240° F., in quart glass jars for 60 minutes, pint glass jars for 55 minutes, and No. 2 and No. 3 tin cans for 50 minutes.

Baby beets.—Only young, tender beets should be canned, and the turnip-shaped varieties make a more attractive product. Wash thoroughly and scald in boiling water or steam for about 15 minutes until the skins slip easily. Leave on at least 1 inch of the stems and all of the roots during this cooking to prevent bleeding. Slip off the skins, fill into the containers, add 1 teaspoon of salt to each quart, and fill with hot water. Process immediately at 10 pounds pressure, or 240° F., quart glass jars for 40 minutes, pint glass jars for 35 minutes, and No. 2 and No. 3 tin cans for 30 minutes.

Pickled beets may be processed in the water-bath canner (p. 17).

Corn.—The garden varieties of corn are the best for canning. They should be gathered about 17 to 25 days after silking, the exact time depending upon variety and season. Shuck, silk, and clean carefully. Cut from the cob without precooking. Add half as much boiling water as corn by weight, heat to boiling, add 1 teaspoon of salt and 2 teaspoons of sugar to each quart, and fill boiling hot into containers. Process immediately at 15 pounds pressure, or 250° F., quart glass jars for 80 minutes, pint glass jars for 75 minutes, and No. 2 tin cans for 70 minutes. Corn should not be canned in No. 3 tin cans, because of the difficulty of heat penetration.

Greens, including spinach.—Pick over the greens, discarding any imperfect leaves and tough, fibrous stems. Wash carefully in running water or through a number of waters, lifting the greens out each time. Steam or heat the greens in a covered vessel until completely wilted, adding in the latter case just enough water to prevent burning. Pack boiling hot into the containers, taking care that the material is not packed too solidly and that there is sufficient liquid to cover, adding boiling water if necessary. Add 1 teaspoon salt to each quart.

Process immediately at 10 pounds pressure, or 240° F., quart glass jars for 90 minutes, pint glass jars for 85 minutes, and No. 2 tin cans for 80 minutes. Greens should not be canned in No. 3 tin cans, because of the difficulty of heat penetration.

Okra.—Only young, tender pods should be canned. The older pods should be dried. After the pods are washed cover with water and bring to a boil. Pack hot in the containers and add 1 teaspoon of salt to each quart. Process immediately at 10 pounds pressure, or 240° F., quart glass jars for 40 minutes, pint glass jars for 35 minutes, and No. 2 and No. 3 tin cans for 30 minutes.

Peas, green.—Use only young, tender peas. Shell, discarding any imperfect peas, and wash. Bring to boil in water to cover. Pack boiling hot into the containers, and add 1 teaspoon of salt to each quart. Process immediately at 10 pounds pressure, or 240° F., quart glass jars for 50 minutes, pint glass jars for 40 minutes, and No. 2 and No. 3 tin cans for 30 minutes.

Peas, black-eyed.—Same as Lima beans.

Sweet potatoes.—Where sweet potatoes can be stored successfully, only enough should be canned to take care of the season during which the stored potatoes are not available. If in harvesting more are cut with the plow than can be used immediately, they may be canned in order to save them. In case they are canned at harvesting time it is important that the precooking be slow in order to develop the sugar in the potatoes.

Wash the potatoes thoroughly and boil or steam until the skins slip off readily. Peel, run through the food chopper quickly, so as to keep as hot as possible, and pack hot in the containers. Process immediately at 10 pounds pressure, or 240° F., quart glass jars and No. 3 tin cans for 60 to 70 minutes, and pint glass jars and No. 2 tin cans for 50 minutes.

TIME-TABLE FOR CANNING NONACID VEGETABLES WITH THE PRESSURE CANNER

Pack vegetables as nearly boiling hot as possible, using additional boiling water if necessary. Add 1 teaspoon salt to quart to all vegetables, and 2 teaspoons sugar, if desired, to corn. Place jars or cans in hot canner as soon as they are filled.

Product	Method of treatment before processing	Processing period in pressure canner		
		Quart glass jars	Pint glass jars	No. 2 and No. 3 tin cans
Asparagus	Tie in uniform bundles, place in saucepan with boiling water over lower tough portion, cover tightly, boil 4 to 5 minutes, and pack hot into containers. Or cut in half-inch lengths, bring to boil in water to cover, and pack hot into containers.	40 minutes at 10 pounds pressure, or 240° F.	35 minutes at 10 pounds pressure, or 240° F.	30 minutes at 10 pounds pressure, or 240° F.
Beans, string	Heat to boiling with water to cover. Pack hot into containers.	40 minutes at 10 pounds pressure, or 240° F.	35 minutes at 10 pounds pressure, or 240° F.	30 minutes at 10 pounds pressure, or 240° F.
Beans, Lima	Can only young and tender beans, using method suggested for peas.	60 minutes at 10 pounds pressure, or 240° F.	55 minutes at 10 pounds pressure, or 240° F.	50 minutes at 10 pounds pressure, or 240° F.
Baby beets	Can only young tender beets. Scald in boiling water or steam until the skins slip easily. Skin and pack hot into containers.	40 minutes at 10 pounds pressure, or 240° F.	35 minutes at 10 pounds pressure, or 240° F.	30 minutes at 10 pounds pressure, or 240° F.
Corn	Cut off without precooking. Add half as much boiling water as corn by weight, heat to boiling, and pack hot into containers.	80 minutes at 15 pounds pressure, or 250° F.	75 minutes at 15 pounds pressure, or 250° F.	70 minutes at 15 pounds pressure, or 250° F.[1]
Greens, including spinach	Steam or heat in covered vessel until completely wilted, using just enough water to prevent burning. Pack hot into containers, taking care that the material is not packed too solidly and that there is liquid to cover.	90 minutes at 10 pounds pressure, or 240° F.	85 minutes at 10 pounds presure, or 240° F.	80 minutes at 10 pounds pressure, or 240° F.[1]
Okra	Can only young, tender pods. Cover with water and bring to boil. Pack hot into containers.	40 minutes at 10 pounds pressure, or 240° F.	35 minutes at 10 pounds pressure, or 240° F.	30 minutes at 10 pounds pressure, or 240° F.
Peas, green	Use only tender young peas. Bring to boil with water to cover and pack hot into containers.	50 minutes at 10 pounds pressure, or 240° F.	40 minutes at 10 pounds pressure, or 240° F.	30 minutes at 10 pounds pressure, or 240° F.
Peas, black-eyed	Same as Lima beans			
Sweet potatoes	Boil or steam until skins slip off readily. Peel quickly and pack hot into containers.	60 to 70 minutes at 10 pounds pressure, or 240° F.	50 minutes at 10 pounds pressure, or 240° F.	No. 2 cans 50 minutes and No. 3 cans 60 to 70 minutes, at 10 pounds pressure, or 240° F.

[1] Should not be canned in No. 3 cans because of difficulty of heat penetration.

EXAMINATION OF CANNED FOOD BEFORE USE

It is important that all canned food be carefully examined before using. Spoilage is frequently indicated by the exterior of the can or jar. In tin cans both ends should be flat or curved slightly inward. Neither end should bulge or snap back when pressed. All seams should be tight and clean, with no traces of leaks. In glass jars the cover, if of metal without porcelain lining, should be firm and flat or curved slightly inward, as suggested in the case of tin cans. There should be no sign of leakage around the rubber ring or elsewhere. The contents should appear sound, and the liquid should be no more cloudy than when the material was first canned.

When the can is opened there should not be any sudden outrush of air or spurting of liquid. Smell the contents at once. The odor should be characteristic of the product. Any "off" odor probably indicates spoilage. At this stage examine any material which has been canned in tin to see whether it appears sound and normal in color. Examine the inside of the can. It should be smooth and clean, or well lacquered, not extensively blackened or markedly corroded.

The two types of spoilage most frequently occurring are "swells" and "flat-sours." Both these are easily distinguished, the swells by the bulging of the ends of the tin or the outrush of gas, and the flat-sours by the sour odor. A third type of spoilage, that due to the presence of *Bacillus botulinus*, is more difficult to detect. If the spores of this bacterium are not killed during canning but germinate in the closed container, a toxin or poison is formed that is very deadly. In some cases this organism may develop and form this poison with very little indication of spoilage in the food, and death has resulted from even a taste to determine whether the product was suitable for use. When present in small quantities, this toxin is destroyed by boiling, and it is therefore recommended that all canned vegetables and meats be boiled for at least 10 minutes before they are tasted. In case the liquid in the container is not sufficient to cover add boiling water. Smell the hot food carefully, since boiling brings out odors not noticeable in cold canned foods.

Canned products showing signs of spoilage should always be destroyed. If the botulinus toxin should be present, it will poison animals as well as humans; therefore every precaution should be taken to see that any spoiled canned goods are disposed of safely. If buried, it should be so deep that it can not be scratched up by chickens or dogs. Boiling with a generous tablespoonful of lye for each quart will destroy both toxin and bacteria.

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